Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar **Subject – Physics**
Paper – Solid state and Nano Physics **Class – B.Sc. 6th Semester**

Weeks With Months	Contents
31st Jan. – 04th Feb.	Unit I: Crystal Structure I Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell
Feb. 06-11	Wigner Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller Indices, Interplaner spacing,
Feb. 13-18	Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond Numerical Problems. Unit II: Crystal Structure II X ray diffraction, Bragg's Law and experimental X ray diffraction methods
Feb. 20-25	K space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.
Feb. 27- March 04	Unit III: Super conductivity Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation
March 06-11	Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization,Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.
March 13-18	Unit IV: Introduction to Nano Physics Definition, Length scale, Importance of Nano scale and technology, History of Nanotechnology, Benefits and challenges in molecular manufacturing. Molecular assemesterbler concept, Understanding advanced capabilities. Vision and objective of Nanotechnology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine
March 20-25	Revision & Test

Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar **Subject – Physics**
Paper – Statistical Physics **Class – B.Sc. 4th Semester**

Weeks With Months	Contents
31st Jan. – 04th Feb.	Unit –I: Statistical Physics I Microscopic and Macroscopic systems, eventsmutually exclusive, dependent and independent. Probability, statistical probabilityA priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations
Feb. 06-11	distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamically probability, Constraints and Accessible states, Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes
Feb. 13-18	Unit –II: Statistical Physics II Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law
Feb. 20-25	Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian Distribution. Numerical and problem discussion. Unit-III: Quantum Statistics Need for Quantum Statistics: Bose Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law
Feb. 27- March 04	B.E. gas Degeneracy and B.E. Condensation. Fermi Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals
March 06-11	Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas, Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics.

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March 13-18	Unit-IV: Theory of Specific Heat of Solids Dulong and Petit law. Derivation of Dulong and Petit law from classical physics.
March 20-25	Specific heat at low temperature, Einstein theory of specifi c heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories. Revision & Test

Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar
Paper – Atomic and Molecular spectroscopy

Subject – Physics
Class – B.Sc. 6th Semester

Weeks With Months	Contents
March 27- April 01	Unit – I: Historical background of atomic spectroscopy Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of Hydrogen atom in Balmer series, Bohr atomic model(Bohr's postulates) , spectra of Hydrogen atom , explanation of spectral series in Hydrogen atom, unquantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass
April 03-08	Short comings of Bohr's theory, Wilson sommerfeld quantization rule, deBroglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of BohrSommerfeld theory, Vector atom model;space quantization, electron spin, coupling of orbital and spin angular momentum, spectroscopic terms and their notation, quantum numbers associated with vector atom model, transition probability and selection rules.
April 10-15	Unit –II: Vector Atom Model (single valance electron) Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and th eorem. Penetrating and Nonpenetrating orbits, Penetrating orbits on the classical model; Quantum defect,
April 17-22	spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and nonpenetrating orbits. quantum mechanical relativity correction, Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, RydeburgRitze combination principle, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum .
April 24-29	UNIT-III: Vector Atom model (two valance electrons)Essential features of spectra of Alkalineearth elements, Vector model for two valance electron atom: application of spectra. Coupling Schemes;LS or Russell – Saunders CouplingScheme and JJ coupling scheme,

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	Interaction energy in LS coupling (sp, pd configuration), Lande interval rule, Pauli principal and periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and nonequivalent electrons, Two valance electron systemspectral terms of nonequivalent and equivalent electrons, comparison of spectral terms in LS And JJ coupling.
May 01-06	Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin. **Unit –IV:** Atom in External Field Zeeman Effect (normal and Anomalous),Experimental setup for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande gfactor), Zeeman pattern of D1 and D2 lines of Naatom,.
May 07-12	PaschenBack effect of a single valence electron system. Weak field Stark effect of Hydrogen atom. Molecular Physics General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.
May 13-19	Revision & Test

Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar **Subject – Physics**
Paper – Properties of Matter & Kinetic Theory of Gases **Class – B.Sc. 2nd Semester**

Weeks With Months	Contents
31st Jan. – 04th Feb.	Unit-1 Introduction, Rotation of Rigid Body, Moment of Inertia, Torque Angular Momentum
Feb. 06-11	K.E. of Rotation, Theorem of Parallel & perpendicular Axis Moment of Inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder
Feb. 13-18	M.O.I. of Solid bar of rectangular cross section, Flywheel, Irregular body, Acceleration of a body rolling down an inclined plane
Feb. 20-25	Problem Discussion and Test of Unit-1 Unit-2 Introduction, Elasticity, Stress and strain, Hooks LawElastic constant and their relation, Poisson's ratio, Torsion of cylinder twisting couple
Feb. 27- March 04	Determination of coeff. Of rigidity of wire by Maxwell's needle, Bending of Beam, Cantilever and centrally loaded beam, Youngs modulus for material of beam and Elastic constants of wire by Searle's method
March 06-11	Problem Discussion and Test of Unit-2 Unit-3 Introduction, Assumption of Kinetic Theory of Gases, pressure of an ideal gas, Kinetic interpretation of Temp., Ideal Gas Equation, Degree of Freedom
March 13-18	Law of Equipartition of energy and its application for specific heat of gases, Real Gases, Vander wall's Equation, Brownian Motion Unit-4 Introduction, Maxwell's distribution of speed and velocities,
March 20-25	Exp. Verification of Maxwell's law of speed distribution : Most Probable Speed, Average and r.m.s. speed, Mean Free Path, Transport of energy and momentum, Diffusion of Gases Problem Discussion and Test of Unit-4

Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar **Subject – Physics**

Paper – Wave and optics-II **Class – B.Sc 4th Semester**

Weeks With Months	Contents
March 27- April 01	Unit-1: Polarization Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate
April 03-08	production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz)
April 10-15	Unit-II: Fourier analysis Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem. even and odd functions, Fourier series of functions f(x) between (i) 0 to 2pi, (ii) –pi to pi, (iii) 0 to pi, (iv) –L to L
April 17-22	Complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of triangular and rectangular waves Half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.
April 24-29	Unit III: Fourier transforms Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions: 1. f(x)= e x2/2 1 |X|<a 2 . f(x) = 0 |X |>a
May 01-06	Geometrical Optics I Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lens

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	Unit-IV: Geometrical Optics II Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies. Fiber Optics Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle,
May 07-12	Fractional refractive index change. Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages
May 13-19	Revision & Test

Lesson Plan for Session 2022-23

Name of Teacher – Dr. Surender Kumar **Subject – Physics**
Paper – Semiconductor Devices **Class – B.Sc. 2nd Semester**

Weeks With Months	Contents
March 27- April 01	Unit I: Semestericonductors Energy bands In solids, Intrinsic and extrinsic semestericonductors, carrier mobility and Elect. resistivity of semestericonductors, Hall effect, p-n junction diode and their Ch., Zener and Avalanche breakdown, Zener diode
April 03-08	Hall effect, p-n junction diode and their Ch., Zener and Avalanche breakdown, Zen er diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semestericonductors, Photodiode, Solar Cell, pn junction as a rectifier, half wav e and full wave rectifiers , filters (series inductor, shunt capacitance, choke, n and R.C. filter circuits)
April 10-15	Unit 2: Transistors Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (CB, CE, CC modes),Common base, common emitter and common collector characteristics of transistor
April 17-22	Constants of a transistor and their relation, Advantages and disadvantages of CE configuration. D.C. load line .Transistor biasing; various methods of transistor biasing and stabilization.
April 24-29	Unit 3: Transistor Amplifiers Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers, various methods of coupling
May 01-06	Resistance Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers.
May 07-12	Unit 4: Oscillators Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).
May 13-19	Revision & test